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Paul C. Rizzo Associates, Inc.
CONSULTANTS

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Final
Quality Assurance/Quality Control Plan

Pulverizing Services Site
Moorestown, New Jersey

PPG Industries, Inc.
Pittsburgh, Pennsylvania

300142

FINAL QUALITY ASSURANCE/QUALITY CONTROL PLAN
PHASE I STUDY AREA INVESTIGATION
PULVERIZING SERVICES SITE
MOORESTOWN, NEW JERSEY

PROJECT NO. 89-595
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PULVERIZING SERVICES SITE
MOORESTOWN, NEW JERSEY

1.0 INTRODUCTION

1.1 BACKGROUND

This Quality Assurance/Quality Control Plan (QA/QC Plan) for the Pulverizing Services Site has been prepared in response to the Administrative Order on Consent (Order) of March 31, 1989 executed between the United States Environmental Protection Agency (USEPA) and PPG Industries, Inc. (PPG). In accordance with the Order, this QA/QC Plan and the Phase I Site Operation Plan have been prepared. The purpose of this QA/QC Plan is to set forth in detail data quality objectives, sample collection procedures, data analysis processes, and procedures to ensure that the objectives of the Order are met. In accordance with the Order, this plan is designed to comply with the standards in Section 10 of the USEPA publication, "Test Methods for Evaluating Solid Waste," second edition (SW-846).

1.2 FORMAT

The contents of this QA/QC Plan are based on the requirements of Section 10 of SW-846 and the format is consistent with USEPA publication QAMS-005/80. Tables and figures are provided following the text. Additional data or procedures which supplement the text are provided in Appendices A through D.

Each page of this QAPP has document control information provided in the upper right-hand corner. This information includes:

- Section Number
- Revision Number
- Date of Revision
- Page Number in the Section

1.3 ABBREVIATIONS AND CONVENTIONS

Abbreviations for some chemical names and other terms which are frequently used in the text are as follows:

• Polychlorinated Biphenyl	PCB
• Milliliters	ml
• Microliters	ul
• Liters	l
• Milligrams	mg
• Nanograms	ng
• Micrograms	ug
• Grams	g
• Pentachloronitrobenzene	PCNB
• 2,3,7,8-Tetrachlorodibenzo -p-dioxin	2,3,7,8-TCDD
• Target Compound List	TCL
• Contract Laboratory Program	CLP

2.0 SITE HISTORY AND DESCRIPTION

A brief history and description of the site is provided in Section 2.0 of the Phase I Site Operations Plan.

3.0 PROJECT ORGANIZATION AND RESPONSIBILITY

Paul C. Rizzo Associates (Rizzo Associates) has been retained by PPG to perform the site investigation.

A description of the project organization is provided in this section. Table 3-1 lists the addresses and telephone numbers of the individuals identified herein.

3.1 FACILITY COORDINATOR

Mr. Malcolm W. Petroccia is Facility Coordinator for PPG Industries, Inc. Mr. Petroccia will be the point of contact in the PPG organization for Rizzo Associates. He will monitor performance, schedules, and budget considerations.

3.2 PROJECT DIRECTOR

Mr. Patrick F. O'Hara is the Rizzo Project Director for the site. His responsibilities include:

- Ensuring that sufficient resources are available to the project team so that it can respond fully to the requirements of the site investigation.
- Providing direction and guidance to the Project Manager as needed.
- Providing senior level review of technical activities.

3.3 PROJECT MANAGER

Dr. J. Timothy Onstott is the Rizzo Project Manager for the site. He will be responsible for all technical, financial, and scheduling matters. Other responsibilities will include:

- Interaction with Quality Assurance Officer and Health and Safety Officer to assure that these programs are functioning effectively.

- Approval of project-specific procedures and internally prepared plans, drawings, and reports.
- Serving as the "collection point" for project staff reporting of nonconformances and changes in project documents and activities.

3.4 QUALITY ASSURANCE OFFICER

Ms. Beth Cockcroft will be the Rizzo Quality Assurance Officer for the project. Her responsibilities will include:

- Development, review, and approval of the QA/QC Plan.
- Administration of the project Quality Assurance Program.
- Day-to-day supervision of quality assurance activities.
- Notification of personnel of nonconformances and changes in quality assurance procedures.
- Determination of the audit schedule.

The Quality Assurance Director reports to the Project Director. She may act independently from the Project Manager, if required, to effect compliance with the QA/QC Plan. She will provide the necessary guidance to the project and laboratory staffs on quality-related matters and will be responsible for project audits. She has the authority and freedom to identify quality problems; to initiate, recommend, or provide corrective actions; and to verify the implementation of the corrective actions. She will initiate project audits.

3.5 HEALTH AND SAFETY COORDINATOR

Mr. Kenneth J. Bird is Health and Safety Coordinator for the project. Mr. Bird is responsible for the development and implementation of the Health and Safety Plan.

3.6 LABORATORY PERSONNEL

The key laboratory personnel for this project will be the Laboratory Project Manager and the Laboratory Quality Assurance Officer. The analytical laboratory project manager will be responsible for execution of the analytical testing program for the project. Lancaster Laboratories, Inc. has been selected to perform analytical testing for the project. Ms. Anneliese Hutchison will be the Laboratory Project Manager and Ms. M. Louise Seats is the Laboratory Quality Assurance Officer.

3.7 TECHNICAL AND SUPPORT STAFF

Individuals in this category will participate in the technical activities associated with the project. They will report to the Project Manager.

4.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

The quality of data generated for this investigation can be characterized in terms of precision, accuracy, completeness, representativeness, and comparability. The QA objectives for accomplishing the investigation objectives for precision, accuracy, and completeness are indicated in Table 4-1. These data characteristics are defined in the following subsections.

4.1 PRECISION

Precision is defined as a measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. Precision evaluation indicates whether the reproducibility of the analytical result is compromised due to analytical techniques, sample matrix interferences, or other factors.

4.2 ACCURACY

Accuracy is defined as the degree of agreement of a measurement (or an average of measurements of the same thing) with an accepted reference or true value, usually expressed as:

- The difference between the two values,
- The percentage of the difference relative to the reference or true value, or
- The ratio of the difference to the reference or true value.

4.3 COMPLETENESS

Completeness is defined as a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected under normal conditions. To determine completeness, the percentage of valid (i.e., acceptable) data obtained, as judged by the precision and accuracy objectives, is compared to the total amount of

data collected, resulting in a validation percent. Table 4-1 lists the completeness objectives for accomplishing the Phase I investigation objectives. Section 13.0 provides a discussion of procedures to assess data completeness.

4.4 REPRESENTATIVENESS

Representativeness expresses the degree to which data accurately and precisely represent a measured characteristic of a population, parameter variations at the sampling point, a process condition, or an environmental condition.

The degree of representativeness is dependent upon the objectives of the measurement results. Thus, representativeness can be classified into the following four "objective levels":

- Level 1
  Only representative of the point of sampling. (Example: drum, storage tank, single point within a stream or a land area.)
- Level 2
  Sample is part of a set and represents a defined area or portion of land or water--not just the point of sampling. (Example: a stream transect, sampling grid of a land area, underground aquifer, etc.)
- Level 3
  Sample represents a relationship between the source of contamination and the location sampled. (Example: source and monitoring well, source and stream, etc.)
- Level 4
  Nonrepresentative sample. Sample is used for assessment purposes only. (Example: preliminary assessment, spot check.)

The objective of all sampling, monitoring, and analysis will be that results are representative of the medium investigated (soil, water, etc.) and its condition to a degree consistent with the desired objective level. Objective Levels 1 and 2 will be employed to accomplish the objectives of this study.

4.5 COMPARABILITY

A number of different organizations have collected data for the site in the past. Some of the data were collected by USEPA or their contractors and it is assumed that Contract Laboratory Procedures were used for these studies. The analysis of USEPA samples by CLP methods in use at the time of sampling and these methods may be slightly different than those listed herein.

Despite the qualifications mentioned above, past data from the USEPA will be used as supplementary information in the determination of the presence and levels of contaminants.

5.0 SAMPLING PROCEDURES

Sampling procedures are provided in this section. The discussion in this section includes general documentation requirements as well as specific data forms required for the various types of samples. Sample preparation and handling are addressed, as well as decontamination of sampling equipment. Sample locations are described in the Phase I Site Operations Plan.

5.1 GENERAL DOCUMENTATION REQUIREMENTS

Each day work is performed at the site, a Field Activity Daily Log will be completed by the field staff. It will be the responsibility of the site Field Supervisor to insure that this record is completed. Information to be provided on the log includes, as appropriate:

- Field activity subject
- General work activity
- Unusual events
- Changes to plans and specifications
- Visitors on site
- Subcontractor progress or problems
- Communication with PPG or others
- Weather conditions
- Personnel on site
- Field reagents used

The Field Activity Data Log will be signed by the individual who prepares it. Field Activity Daily Logs will be submitted on a weekly basis to the Project Manager. Following review, the logs will be placed in the project file. A blank Field Activity Daily Log is provided in Appendix B.

A photographic record of site operations will be prepared. Photographs of the following are normally obtained:

- General site layout,
- Geologic features,
- Streams or impoundments,

- Drilling,
- Well installation,
- Sampling,
- Health and safety monitoring, and
- Other items of interest.

Photographs will be identified with the project number, date, and a brief description. The photographs will be placed in the project file.

Other data forms used for documenting boring data, sample data, and field tests are described in the subsections which follow. Chain-of-custody documentation is described in Section 6.0.

5.2 SAMPLING

Sampling of borings, monitoring wells, and stream sediments is discussed in the following subsections. In general, polyethylene sheeting will be used at sampling sites to prevent the spread of contamination.

5.2.1 Samples From Borings

The investigation will include a number of borings from which samples for analytical testing will be obtained. Samples of soil and unconsolidated materials will be obtained from Standard Penetration Tests (SPTs). The procedures which will be used for drilling are provided in Appendix A.

Soil samples will be obtained from the split-barrel sampler used for SPTs. The samples will be examined and classified, and the data, including visual observations, will be entered onto the boring log. Samples will then be placed in a clear glass jar provided by the driller. Pertinent sample data such as project number, boring number, sample number, depth, and SPT blow counts will be marked on the jar labels and lids. The jars will be placed in boxes, and the boxes will be stored in a secure area which is protected from the weather and from temperature extremes.

Split-barrel samples receiving analytical testing will be placed in appropriate containers supplied by the laboratory, and the containers will be labeled and handled as described in Section 5.3. Soil samples (except those to be analyzed for volatile organics) will be thoroughly mixed to insure that they are homogeneous.

5.2.2 Sediment Samples

Sediment samples will be grab samples and will be collected manually in a downstream to upstream sequence if sampling occurs at more than one location. All sample locations will be approached from downstream. Sediment samples will be obtained with a stainless steel trowel. The portion of the sample for volatile organics analysis shall be placed directly in 120-ml VOA vials. The remaining sample will be placed in a stainless steel pan and thoroughly mixed with the trowel. The sediment in the pan will be scraped from the sides, corners, and bottom of the pan, rolled to the middle of the pan and initially mixed. The sample will then be quartered and each quarter moved to a corner of the pan. The quarters will be mixed individually, then recombined in the center of the pan and mixed again. The sediment will then be placed in the appropriate sample containers. The lids will be secured tightly after any sediment is removed from the threads of the containers. Sampling locations will be marked with a numbered stake which will be surveyed to record the sample location. The labeling and handling of sample containers is discussed in Section 5.3.

5.2.3 Groundwater Sampling

Monitoring wells will be installed at the site. The procedures for well installation are provided in Appendix A.

The primary consideration for sampling monitoring wells will be to obtain a representative sample of the groundwater in the vicinity of the well. To safeguard against collecting nonrepresentative stagnant water from a well, the following guidelines and techniques will be observed for purging monitoring wells prior to sample withdrawal:

- Water levels will be measured with an accuracy of ±0.01 foot. The reference point for measurements will be the top of the monitoring well riser pipe and this will be indicated on the Water Sample Field Collection Report (Appendix B).

- The submerged casing volume (standing water column) in the well will be determined from the following formula:

$$V = \frac{7.48}{144} \pi r^2 h$$

where,

V = volume, gallons
r = riser pipe radius, inches
h = standing water height as determined from water level measurements and monitoring well construction logs, feet.

This quantity constitutes one well volume of water. A minimum of three well volumes will be purged prior to sampling.

- Purging shall be accomplished by using an air lift pump or by hand bailing water from the monitoring well. Purge water for each well will be collected in drums or a tank. The stored purge water will be analyzed to assess proper disposal methods.

- A well stabilization test will be performed during the purging of the well. Temperature, pH, and specific conductance will be measured after fractional increments of the purge volume have been removed (e.g., after each third of the purge volume). If the last three sets of readings are approximately constant, the purging will be considered complete. If the readings have not stabilized, additional water will be purged until the desired results are obtained.

- Wells will be sampled within three hours of purging. If a well purges dry (i.e., all standing water is removed) prior to removal of three well volumes, a well-stabilization test will not be required. Such wells will be sampled when enough water recharges the well to obtain a sample. The water level will be recorded at time of sampling. If the well

recharges too slowly to fill all the required containers within three hours, the containers will be filled in the following order:

- VOAs,
- Semivolatile Organics,
- PCBs/Pesticides,
- Total Recoverable Petroleum Hydrocarbons,
- Metals, and
- Cyanide.

The water level, pH, temperature, and specific conductance will be recorded when samples are taken.

Wells will be sampled with a bottom-loading stainless-steel hand bailer, which has been decontaminated prior to usage (see Section 5.4). The bailers will be lowered into the well by hand and allowed to fill completely. The bailer will be removed and the sample containers will be filled by discharging water through the check valve at the bottom of the bailer.

Bailer lines shall be of polypropylene monofilament, stainless steel wire, or teflon-coated wire, or alternatively a nylon line with a ten-foot leader of one of these materials.

If a pump is used to evacuate a well, the tubing which comes into contact with the water will be polyethylene or teflon and will be dedicated to a single well. The intake will be kept just below the water surface as water is withdrawn. No equipment with neoprene, Tygon, silicon rubber, or viton parts shall be lowered into monitoring wells.

The labeling and handling of sample containers is described in Section 5.3.

5.3 SAMPLE PREPARATION AND HANDLING

5.3.1 Sample Containers and Cleaning Requirements

Sample containers will be supplied by the analytical laboratory. This will insure that sufficient sample volume is obtained for laboratory

analysis and associated laboratory QA/QC procedures. The containers which will be used for various sample types and analyses are indicated in Table 5-1.

Sample containers will be purchased from I-Chem. I-Chem's Series 300 containers will be used for this project. Containers will be prepared in accordance with USEPA standard cleaning protocols. Lot numbers will be recorded.

5.3.2 Sample Preservation and Holding Times

Since certain constituents in water can change chemically with time, it will be necessary to preserve individual samples to maintain the integrity of time-dependent constituents. The preservation requirements for various types of samples are indicated in Table 5-1.

Laboratory personnel will send an aliquot of the preservative in a separate container. Field personnel will add the appropriate preservatives as soon as samples are collected. Preservation includes maintaining the samples in a chilled condition (4°C) once they have been obtained. Preservation is generally intended to:

- Retard biological action,
- Retard hydrolysis of chemical compounds and complexes,
- Reduce volatility of constituents, and
- Reduce absorption effects.

The maximum recommended holding times for properly preserved samples are provided in Table 5-1. Most samples will require storage at 4°C prior to analysis to prevent deterioration. The laboratory analysis will be performed within specified holding times to ensure the validity of the analytical results.

5.3.3 Sample Filtration

Monitoring well water samples designated for metals analysis will be obtained as two separate samples: one unfiltered and one filtered. Approximately one liter of the filtered sample will be filtered immediately after collection and prior to preservation. A filter designed to pass only liquid and solid particles less than 45 microns will be used. Turbid samples may be prefiltered prior to filtering through the 0.45-micron cellulose-based membrane filter.

A small, reusable borosilicate glass filter holder system will be employed. All components, except the pump and vacuum hose, will be carefully cleaned (rinsed with distilled or deionized water) prior to filtering of each sample. Cleaning of these units will require disassembly by unscrewing the upper and lower chambers. The used filter will then be removed from the filter holder and discarded, and the system will be rinsed with a 10 percent HNO_3 solution and analyte-free water. After cleaning and reassembly, a new filter will be placed in the filter holder and the sample will be drawn through the filter.

When filtration systems are used, care will be taken not to contaminate the filter or the container receiving filtrate prior to and during filtration.

5.3.4 Sample Labeling and Handling

All sample containers will have blank labels, as supplied by the laboratory. The labels will be filled out at the time of sample collection by the field personnel performing the sampling. Information marked on the label will include:

- Sample Identification Number
- Collector's Name
- Date of Collection
- Type of Sample
- Preservatives Used
- Analysis to be Performed
- Number of Bottles in Sample Set

All samples will be transported to the laboratory in durable, secured metal or plastic coolers or laboratory-supplied, insulated shipping containers. Containers will be shipped via common carrier (e.g., Airborne or Federal Express) or hand carried. Samples will be shipped in accordance with State and Federal DOT Regulations. Chain-of-custody documentation (Section 6.0) will always accompany the samples.

5.4 DECONTAMINATION

Decontamination of equipment used for sampling will be carefully performed to minimize any possibility of cross contamination through the use of tools and equipment. All equipment will be decontaminated prior to initial use.

5.4.1 General

A personnel decontamination station will be located immediately adjacent to the pavement near the northeast corner of Building 29. The station boundaries will be marked with flagging. The personnel decontamination station will have the following components:

- Plastic drop cloths for depositing heavily-contaminated equipment or outer protective clothing.
- Containers for storing contaminated equipment or protective clothing that is to be discarded.
- Tubs for wash and rinse solutions.
- Long handled brushes for washing and rinsing.
- Containers for storage of decontaminated clothing and equipment.
- Disposable wiping cloths and towels.

Personnel passing through the decontamination zone from the exclusion zone will go to a changing trailer located nearby where personal items and clean clothing will be stored. Decontamination and disposal clothing and equipment liquids from the decontamination station will be containerized for storage on site.

Small equipment will be decontaminated in the area where it is used. Fluids and waste materials will be collected for storage on site. Additional details are provided in Section 5.4.2.

Drilling rigs and other large equipment, if appropriate, will be decontaminated on a pad constructed by the drilling contractor. The pad shall be graded and covered with plastic such that decontamination fluids can be collected in a sump which is integral with the pad. Soil and decontamination liquids will be collected for storage on site. Additional details of the decontamination process are provided in Section 5.4.3.

5.4.2 Small Tools and Equipment

This category includes small tools and other apparatus used for sampling, such as bailers and trowels. The following procedure will be employed for decontamination of this equipment:

- Wash with low-phosphate detergent solution (Alconox or Liquinox);
- Rinse with tap water;
- Rinse with 10 percent nitric acid, ultra pure;
- Rinse with tap water;
- Acetone rinse;
- Thorough rinse with deionized water;
- Air dry; and
- Wrap in aluminum foil.

Sampling equipment used for obtaining blanks and samples for dioxin analysis will be rinsed with electronic-grade trichloroethylene following acetone rinse and prior to the rinse with deionized water.

The deionized water shall meet the following criteria:

- Purgeable organics <10 ppb,
- Semivolatile organics <CRQL,
- Pesticides <CRQL,
- PCBs <CRQL, and
- Inorganics <CRQL.

The deionized water shall have been tested and documented no longer than three months prior to use. The documentation will be transmitted to the USEPA prior to usage of the deionized water in the field.

5.4.3 Large Equipment

Large equipment such as a drilling rig will be decontaminated on site between sampling events and prior to leaving the site. Soil or waste present will be scraped or brushed off. The drill rod and other parts of the rig which could be involved in cross contamination will be steam cleaned. If the drilling rig leaves the site, the boom will also be steam cleaned. All equipment decontamination shall be subject to the approval of the field engineer/geologist observing the work.

5.4.4 Other Equipment

Other equipment used in the development of monitoring wells shall be decontaminated as described in Section 5.4.2 or discarded and replaced. The field engineer shall determine if equipment is to be decontaminated or replaced.

6.0 SAMPLE CUSTODY

6.1 FIELD PROCEDURES

A chain-of-custody record will be established and maintained to document sample possession from the time of collection to delivery to the laboratory. Once samples are received by the laboratory, they will be handled under the laboratory internal chain-of-custody procedures. Personnel obtaining samples in the field will initiate a chain-of-custody record by reporting the following minimum data as the samples are collected:

- Name of Sampler
- Sample Identification
- Data and Time Collected
- Amount Collected
- Containers Used

Other information such as preservatives used and analyses required shall be indicated as appropriate. In addition to the chain-of-custody record, a sample-collection form will be completed at the time of sampling to record sample location and other parameters associated with sample acquisition. A typical chain-of-custody record and sample-collection form are provided in Appendix B.

Subsequently, at each change of possession, the chain-of-custody record will be signed by the person relinquishing the samples and the person receiving the samples. This could occur as the samples are transferred from the contaminated portion of the site to a designated clean area, as the samples are transported to the lab, or when the samples are received at the analytical laboratory.

Once the sample containers have been decontaminated, preservatives have been added and the sample containers have been packed for shipment, the shipping container (e.g., cooler, styrofoam box) will be sealed with

custody seals. At a minimum, a custody seal will be placed on diagonal corners of the container lid to seal the lid to the main portion of the shipping container. Depending upon the shipping container, additional custody seals will be used as necessary to prevent unnoticed tampering with the samples. The condition of the custody seals shall be noted by the laboratory personnel upon sample receipt.

If for any reason samples on a chain-of-custody record are split and sent to separate destinations, multiple copies of the records will be generated with a clear indication of which sample went to which destination.

When the samples are received at the analytical laboratory, the person receiving the samples will sign the chain of custody record after accounting for all samples indicated on the record. At this point, the chain-of-custody records will be placed in the laboratory project file and copies will be transmitted to the Project Manager.

6.2 LABORATORY PROCEDURES

The laboratory will designate a sample custodian for the project. This individual will be authorized to sign chain-of-custody records upon sample receipt and will be responsible for verifying that the custody seals are intact.

The project samples will be stored at the laboratory for a period of time related to the type and nature of the samples. Maximum laboratory holding times for various parameters are provided in Table 5-1. When the storage times have expired, the laboratory will dispose of the samples in accordance with applicable regulations.

7.0 CALIBRATION PROCEDURES

Calibration procedures which will be followed for sample analysis are discussed in this section. Calibration information is recorded in a laboratory log book.

7.1 INORGANIC PARAMETERS

Initial calibration for inorganic parameters will be performed in accordance with procedures and frequency described in the reference methods for the analyses to be performed. In general, an analytical curve will be established for each parameter. The analytical curve for Inductively Coupled Plasma (ICP) analysis will be established on the basis of a calibration blank and at least one laboratory standard. A calibration blank and at least three laboratory standards will be used for established analytical curves for cyanide and atomic absorption spectroscopy (AAS) analyses.

A calibration blank will be analyzed each time the instrument is calibrated, at the beginning and the end of the run, and at a frequency of 10 percent during the run. The results for the calibration blank solution shall be recorded. The results for the blank analysis will be reported down a the instrument detection limit. If this blank result is greater than the practical quantitation limit (PQL), the analysis will be terminated, the problem will be corrected, and recalibration will occur.

7.2 ORGANIC PARAMETERS

7.2.1 GC/MS Parameters

GC/MS procedures will be used for the analysis of volatile and semivolatile compounds and 2,3,7,8-TCDD and PCNB. Calibration of the GC/MS will comprise the following:

- Instrument tuning;
- Initial calibration;
- System performance; and
- Continuing calibration.

7.2.1.1 GC/MS Tuning: The GC/MS will be tuned a minimum of once every 12 hours to determine if the instrument is operating properly. The tuning specifications for extractables and volatiles are provided in the reference methods for the parameters to be analyzed. The tuning criteria must be met before standards and samples are analyzed.

7.2.1.2 Initial Calibration: The initial GC/MS calibration will be performed with a blank and five levels of laboratory standards, as described in the reference methods for the parameters to be analyzed. Frequency of calibration will be as described in the reference method.

From each calibration standard, the area corresponding to the primary characteristic ion will be tabulated against concentration for each compound. The relative response factor (RRF) will be calculated for each compound at each concentration using equations provided in the reference methods. Based on the RRF from the initial calibration, the percent relative standard deviation (%RSD) for the calibration check compounds (CCC) will then be calculated. Calibration check compounds are described in Section 7.2.1.4.

7.2.1.3 System Performance: After initial calibration, a system performance check will be carried out to ensure that minimum average relative response factors are met before the calibration curve is used. A system performance check will be made each twelve hours. The system performance check will enable the identification of problems with the analytical system, including fast purge rate, degradation caused by contaminated lines or active sites in the system, or standard mixture degradation.

The volatile system performance calibration compounds (SPCC) and the minimum acceptable average response factors are chloromethane-0.3, 1,1-dichloroethane-0.3, 1,1,2,2-tetrachloroethane-0.3, chlorobenzene-0.3, and bromoform-0.25.

The semivolatile SPCC for CLP methods and SW-846 Method 8270 are N-nitroso-di-n-propylamine, hexachlorocyclopentadiene, 2,4-dinitrophenol, and 4-nitrophenol; each compound must have an average response factor greater than 0.05.

If the average response factor for any SPCC is below the minimum value specified in the reference method for the parameter being analyzed, the system will be considered to be not operating properly, because the SPCC are usually the first compounds to show poor performance. No samples will be analyzed until the system is once again operating properly and the SPCC average response factors are acceptable.

7.2.1.4 Continuing Calibration: If the SPCC criteria are met, calibration check compounds will be used to check the validity of the initial calibration. A CCC standard will be analyzed every 12 hours after the SPCC criteria are met.

If the percent difference for each CCC is less than or equal to 25 percent, the initial calibration is valid. If the criteria are not met (>25 percent difference) for any one CCC, corrective action will be taken. If no source of the problem can be determined after corrective action has been taken, the initial five-point calibration will be repeated.

The volatile CCC are vinyl chloride, ethyl benzene, toluene, 1,2,-dichloroproprane, chloroform, and 1,1-dichloroethene.

Semivolatiles can be divided into two fractions: base/neutral and acid. The CCC for the base/neutral fraction are acenaphthene, 1,4-dichlorobenzene, hexachlorobutadiene, n-nitroso-di-n-phenylamine, di-n-

octylphthalate, fluoranthene, and benzo(a)pyrene. The CCC for the acid fraction are 4-chloro-3-methylphenol, 2,4-dichlorophenol, 2-nitrophenol, phenol, pentachlorophenol, and 2,4,6-trichlorophenol.

7.2.2 GC Parameters

Gas chromatographic systems will be used for PCBs/pesticides and will be calibrated using the external standard technique. This technique is described in detail in the reference methods for the analyses to be performed. A calibration curve for each compound will be prepared based on a minimum of three concentration levels. The sequence of standard analysis and evaluation of standard will be as described in the reference methods. Pesticides tentatively identified in the primary analysis will be confirmed in accordance with CLP and SW-846 procedures.

7.3 FIELD PARAMETERS

Specific conductance, pH, and temperature will be determined in the field when water samples are collected. Calibration procedures and frequency are provided in the reference methods for specific conductance and temperature. The pH calibration procedures will follow the instrument manufacturer's instructions. The reference methods are indicated in Section 8.4.

OVA and HNu will be calibrated according to manufacturer's instructions.

7.4 CALIBRATION STANDARDS

Calibration standards will be obtained from chemical vendors (e.g., Supelco) who document the treatability of their material. If dilutions of the vendor-supplied standards are made, the dilution volumes and procedures will be documented. The dilution calculations will be verified by an individual not involved in the dilution.

7.5 DOCUMENTATION

7.5.1 Field Documentation

Personnel performing calibration of field instruments will record the following information:

- Date,
- Instrument,
- Name,
- Calibration standard,
- Calibration results, and
- Corrective action taken.

For water samples, calibration data for pH, specific conductance, and temperature will be recorded on the Water Sample Field Collection Report (Appendix B) for each water sample collected.

OVA/HNu calibration will be documented on the Field Activity Daily Log (Appendix B).

7.5.2 Laboratory Documentation

Laboratory personnel will record the appropriate calibration information in bound notebooks. A notebook will be kept with each instrument. Information recorded will include the applicable information listed in Section 7.5.1.

8.0 ANALYTICAL PROCEDURES

Most of the analytical procedures for this project will be "USEPA Contract Laboratory Procedures" (CLP) procedures. For parameters for which CLP methods are not available, other EPA-approved methods will be used. The USEPA Contract Laboratory Program identifies a list of compounds which can be analyzed by their methodology. This list is commonly referred to as the Target Compound List (TCL) and includes inorganic and organic compounds. TCL compounds are indicated in Appendix C. Several samples will be analyzed for the compounds on the TCL plus 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD). Most samples will be analyzed for TCL pesticides and three additional pesticides (sevin, pentachloronitrobenzene (PCNB), and malathion) in accordance with the Order.

Other parameters for which analyses will be performed include field parameters associated with water samples (specific conductivity, pH, and temperature). Analyses for these field parameters will be in accordance with USEPA-approved methods. Table 8-1 lists the Phase I analytical program.

Table 8-2 lists the preparation and analytical procedures to be followed for all laboratory parameters, including those on the TCL. Changes in methodology due to higher or lower than anticipated concentrations being detected may change the preparation or analytical method used.

8.1 TCL PARAMETERS

The TCL compounds for this project can be divided into five groups: volatiles, semivolatiles, PCBs/pesticides, metals, and cyanide. The analytical methods for volatiles, semivolatiles, and PCBs/pesticides will be as described in the USEPA Contract Laboratory Program Statement of Work for Organic Analysis (1986, revised July 1987). The analytical

methods for inorganic parameters (metals and cyanide) will be as described in the USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis (1987).

8.2 NON-TCL PARAMETERS

Non-TCL parameters for which analyses will be performed are the pesticides sevin, PCNB, and malathion. Table 8-2 lists the analytical methods for these pesticides. Sevin analyses of soil and water samples will be performed following SOP-734 of the California Department of Health Services, Hazardous Material Laboratory (November 1988). This method has been modified to enable the measurement of sevin.

8.3 2,3,7,8-TCDD

The method for 2,3,7,8-TCDD analysis will be the CLP routine analytical procedure. This method provides for the detection and measurement of 2,3,7,8-TCDD in soil and water samples at concentrations as low as 1.0 ppb (without matrix interferences).

8.4 FIELD PARAMETERS

Temperature, pH, and specific conductance will be measured by field personnel. The USEPA-approved methods are Method 120.1 for specific conductance, Method 150.1 for pH, and Method 170.1 for temperature.

9.0 DATA REDUCTION, VALIDATION, AND REPORTING

9.1 DATA REDUCTION

The analytical laboratory will utilize computer software to calculate sample concentrations for many parameters. A response factor or standard curve will be generated from the calibration standards and applied to either the absorbence, peak height, or area measured by the laboratory instrument to calculate the sample concentration. This value will be corrected for any dilutions or preparation.

Calculations that are not performed by computer programs will be performed manually by the analyst. The analyst will employ the same methodology used in the computer software. Corrections for dilutions and other preparations will be done manually.

The data reduction methods are summarized in the following subsections.

9.1.1. GC/MS Analyses

Sample concentrations for volatile and semivolatile parameters analyzed by GC/MS will be calculated as follows:

$$\text{Reported Results} = \frac{(Q)\ (D)}{C}$$

where:
- Q = Amount reported on software-generated quantitation report (ppm or ppb)
- D = Dilution factor (unitless)
- C = Concentration factor (unitless)

C for volatiles = 1
C for semivolatiles:

$$C\ (\text{Soils}) = \frac{\text{g sample extracted}}{\text{ml } CH_2Cl_2} \times \frac{1}{\%\ \text{Solids}/100}$$

$$C\ (\text{Water}) = \frac{\text{Volume of Sample Extracted (ml)}}{\text{Final Volume of Extract (ml)}}$$

Soil results will be reported on a dry-weight basis.

9.1.2 GC Analyses

Concentrations of PCBs and pesticides analyzed by GC will be calculated by computer software based on the following equations:

$$\text{Water (ug/l)} = \frac{(A)(E)(C)(D)}{(B)(F)(G)}$$

$$\text{Soil (ug/kg)} = \frac{(A)(E)(C)(D)}{(B)(F)(H)(S)}$$

where: A = Peak Height for Parameter of Interest
B = Peak Height of External Standard
C = Volume of Extract (ul)
D = Dilution Factor
E = Amount of Standard Injected (ng)
F = Volume of Extract Injected (ul)
G = Volume of Water Extracted (ml)
H = Weight of Soil Extracted (g)

$$S = \frac{\% \text{ Solid}}{100}$$

9.1.3 Metals

Concentrations will be calculated directly by the instrument (AAS or ICP). This concentration will then be corrected for dilutions and preparation by the analyst.

- Water

$$\text{Concentration (mg/l)} = (A)(D)\frac{E}{F}$$

- Soil

$$\text{Concentration (mg/kg)} = (A)(D)\frac{E}{G(S)}$$

- Where
A = Instrument Reading (mg/l)
D = Dilution Factor (unitless)
E = Final Sample Volume (ml)
F = Original Sample Volume (ml)
G = Original Sample Amount (g)
S = Percent Solids/100

9.1.4 Cyanide

A standard curve will be prepared by plotting absorbence of the laboratory standard versus cyanide concentration, as described in the reference method for cyanide. The concentration of cyanide in the sample will be calculated as follows:

- Water

$$CN\ (ug/l) = \frac{A \times 1{,}000}{B} \times \frac{50\ ml}{C}$$

where: A = ug Cn from Standard Curve
B = g or ml or Original Sample
C = ml Taken for Colorimetric Analysis

- Soil

$$CN\ (ug/l) = \frac{(A)\ (\frac{50\ ml}{B})}{(C)\ (\frac{\%\ Solids}{100})}$$

where: A = ug CN from Standard Curve
B = ml used for Colorimetric Analyses
C = Wet Weight of Original Sample (g)

9.1.5 2,3,7,8-TCDD

The concentration of 2,3,7,8-TCDD is calculated using the formula:

$$C_x = \frac{A_x \times Q_{is}}{A_{is} \times RRF_n \times W}$$

where:
C_x = 2,7,3,8-TCDD concentration in ug/kg or ug/l
A_x = The sum of integrated ion abundance detected for m/z 320 and 322
A_{is} = The sum of integrated ion abundances detected for m/z 332 and 334 (characteristic ions of $^{13}C_{12}$-2,3,7,8-TCDD the internal standard)
Q_{is} = Quantity (in ng) of $^{13}C_{12}$-2,3,7,8-TCDD added to the sample before extraction
RRF_n = Calculated mean response factor for unlabeled 2,3,7,8-TCDD relative to $^{13}C_{12}$-2,3,7,8-TCDD
W = The weight (in g) of soil/sediment extracted or volume of water extracted (in ml)

For samples in which unlabeled 2,3,7,8-TCDD was not detected the estimated maximum possible concentration (MPC) will be calculated. The MPC is the concentration required to produce a signal with a peak height of 2.5 times the background signal height and is calculated as follows:

$$MPC = \frac{2.5 \times H_x \times Q_{is}}{H_{is} \times RRF_n \times W}$$

where: MPC = Maximum possible concentration of unlabeled 2,3,7,8-TCDD required to produce H_x

H_x = Peak height for m/z 320 or 322 in the same group of >5 scans used to measure A_{is}

H_{is} = Peak height for the appropriate ion characteristic of the internal standard, m/z 332 when 320 is used to determine A_x, and m/z 334 when 322 is used to determine A_x

Q_{is} = Quantity (in ng) of $^{13}C_{12}$-2,3,7,8-TCDD added to the sample before extraction

RRF_n = Calculated mean response factor for unlabeled 2,3,7,8-TCDD relative to $^{13}C_{12}$-2,3,7,8-TCDD

W = Weight (in g) of wet soil/sediment sample or volume of water extracted (in ml)

9.2 DATA VALIDATION AND ASSESSMENT

The primary objective of this project is to provide data of sufficient quality for decision-making purposes concerning response action alternatives. It is anticipated that by using CLP and USEPA procedures the laboratory will provide reliable and acceptable data to adequately characterize the site for response actions.

The analytical laboratory will perform a review of the data prior to submittal to Rizzo Associates. After the laboratory review, QC data and sample results will be reviewed for validation purposes by Rizzo Associates. Guidelines described in USEPA Standard Operating Procedures, in the reference methods, CLP guidelines, and this plan will be used in the results validation by the laboratory and Rizzo Associates.

USEPA Standard Operating Procedures which will be utilized in the data validation include the following:

- SOP No. HW-2, Evaluation of Metals Data for the Contract Laboratory Program, Revision 9, October 1989.
- SOP No. HW-5, CLP Dioxin (2,3,7,8 TCDD) Data Review, Revision 4, June 1989.
- SOP No. HW-6, CLP Organics Data Review and Preliminary Review, Revision 6, March 1989.

Rizzo Associates will receive a data summary package from the laboratory. A data summary package will contain the following information when applicable:

- Analytical results,
- MS/MSD results,
- Surrogate recoveries,
- Method and trip blanks results,
- ICP interference results,
- Duplicate sample analysis,
- Spike sample analysis, and
- Holding times.

The information in the data summary package will be used by Rizzo Associates to validate the results. Rizzo Associates will follow CLP guidelines in validation of the Phase I results. Rizzo Associates will provide validated analytical results in the Phase I report and will maintain this information in accordance with the Order. PPG and its subcontractors will make available to the USEPA results of all sampling and/or tests pursuant to the implementation of the Order.

Validation of data is a complex and sometimes subjective task due to the complexities and uniqueness of data relative to specific samples. Data validation procedures for this project will be computerized, and manual

checks will be applied at various appropriate levels of the measurement process. Criteria for data validation include operational parameters (e.g., GC conditions), calibration data, and quality control procedures.

Operational parameters are discussed in the reference methods for specific parameters. Calibration data and the limits controlling calibration to ensure valid results are described in Section 7.0. The following subsections provide a summary of guidelines for data validation relating to the quality control procedures discussed in Section 10.0.

9.2.1 Surrogates

All samples, blanks, matrix spikes, and matrix spike duplicates analyzed for volatiles, semivolatiles, and pesticides will be spiked with surrogate compounds prior to purging or extraction. The amount of surrogate to be spiked is indicated in the reference methods. Surrogates which apply to the analyses are described in Section 10.3.1. The review of the surrogate results will be performed in accordance with the USEPA publication, "Functional Guidelines for Evaluating Organic Analysis."

9.2.2 Organic Method Blank Analysis

An acceptable method blank will contain less than or equal to five times the quantitation limits specified in the volatile and semivolatile methods for methylene chloride, acetone, toluene, 2-butanone, and the phthalate esters. For other compounds, the method blank must contain less than or equal to the quantitation limit for the parameters.

If a method blank exceeds the above criteria, corrective actions as described in the reference method will be implemented. All samples processed with the questionable method blank will be re-extracted and re-analyzed when the corrective measures have been implemented. Results will be flagged, as described in Section 9.3.1, if the method blank after re-analysis is outside acceptable limits.

9.2.3 Matrix Spike/Matrix Spike Duplicate Analysis

After each matrix spike and matrix spike duplicate set is analyzed, the relative percent difference (RPD) will be calculated. If the RPD is outside the limits set in the reference methods, the associated results will be flagged as described in Section 9.3.1. In accordance with CLP methodology, re-extraction or re-analysis will not be done.

9.2.4 Inorganic Method Blank Analysis

Method blanks for inorganic parameters will be used in the following manner to ascertain whether sample concentrations reflect contamination:

- If the concentration of the blank is less than or equal to the detection level, no correction of sample results will be performed.
- If the concentration of the blank is above the detection level and the samples associated with the blank are not 10 times greater in concentration, then all associated samples will be redigested and re-analyzed with the exception of an identified field blank. The sample value will not be corrected for the blank value.

9.2.5 ICP Interference Check Sample

During the analytical runs, results for the ICP interference check sample analysis must fall within the control limit of ±20 percent of the true value for the analytes included in the interference check sample. If this does not occur, the laboratory will terminate the analysis, correct the problem, recalibrate, reverify the calibration, and re-analyze the samples.

9.2.6 ICP Serial Dilution Analysis

If the analyte concentration is sufficiently high (minimally, a factor of 10 above the instrumental detection limit after dilution) for ICP analysis, an analysis of a 1:4 dilution must fall within ±10 percent of the original determination. If the dilution analysis is not within 10

percent of the original determination, a chemical or physical interference effect should be suspected, and the data will be flagged as described in Section 9.3.1.

9.2.7 Spike Sample Analysis

Percent recovery will be calculated by the equation provided in the reference methods. If the spike recovery is not within the limits of 75-125 percent, the data for all samples received that are associated with that spike sample will be flagged. An exception to this rule will be situations where the sample concentration exceeds the spike concentration by a factor of four or more. In such a case, the spike recovery will be ignored and the data shall be reported unflagged even if the percent recovery does not meet the 75-125 percent recovery criterion.

9.2.8 Duplicate Sample Analysis

Duplicate analysis will be performed at a frequency of 5 percent. Due to the small number of samples for each matrix, the results of duplicate analysis will be used as an indication of precision. The relative percent differences (RPD) for each component will be calculated in accordance with the appropriate inorganic reference method. A control limit of ±20 percent for RPD shall be used for sample values greater than five times the detection level. A control limit of ± (the quantitation limit) shall be used for sample values less than five times the quantitation limit. If one result is more than five times the quantitation limit and the other is less, the ± (quantitation limit) criterion will be used. If either sample concentration is less than the quantitation limit, the RPD will not be calculated and will be indicated as "NC."

If the duplicate sample results are outside the control limits, all data for samples associated with that duplicate sample will be flagged.

9.2.9 Field Blanks and Splits

In the validation process, field QC practices consisting of field blanks and equipment blanks will also be reviewed. Due to the complexity of environmental samples, no formal evaluation procedures will be established for reviewing field QC, and only subjective guidelines are provided in this section. The objective of field QC will be to monitor the performance of the field and laboratory personnel.

Field blanks (trip and equipment) will be used to monitor for contamination introduced by sampling personnel, although laboratory introduced contamination will also be indicated. If an equipment blank indicates contamination while the method blank does not, a review of equipment decontamination and container cleaning practices will be instituted, and changes will be made as necessary. If the trip and equipment blanks indicate contamination and the method blank does not, possible causes, including poor sample container cleaning, will be investigated. Appropriate corrective actions will be implemented.

Field splits or duplicate samples will be evaluated for long-term trends which indicate that corrective action is necessary. The review of the field split results is subjective. If the results consistently display significant differences that cannot be explained by normal inherent sample characteristics (e.g., matrix interferences, sample heterogeneity), the entire sample collection and analytical process will be reviewed.

Except in the case of gross errors, field blanks and splits will not be the basis of acceptance or rejection of data, but rather will serve as additional information for evaluation of the data.

9.2.10 Holding Time

The holding time of samples (time of collection to time of sample preparation and analysis) will be reviewed to ensure compliance with the requirements of Table 5-1. If holding time of TCL compounds is

exceeded, the parameters will be flagged as "questionable" in accordance with CLP guidelines. Holding times for sevin, PCNB, and malathion will be reviewed and handled in the same manner as TCL pesticides.

Measurement of field parameters will be performed at the time of collection.

9.3 DATA REPORTING

The analytical laboratory will follow CLP procedures for reporting of TCL compounds. Data related to non-TCL pesticides, pH, specific conductance, and temperature will be reported in accordance with procedures indicated in their respective reference methods.

In general, soil sample data will be reported on a dry-weight basis and pH will be reported to 0.1 pH units. For volatiles and semivolatiles, one significant figure will be reported for values less than ten and two significant figures will be reported for values above ten. PCBs data will be reported to two significant figures. Reported concentrations will not be corrected for contaminants found in associated blanks.

9.3.1 Qualifiers

The analytical laboratory will use CLP-defined qualifiers in reporting data. The flags for organic analyses are as follows:

- U - Indicates analysis was performed for compound but was not detected.
- J - Indicates an estimated value.
- C - Applies to pesticide results where the identification has been confirmed by GC/MS.
- B - Used when the analyte is found in the associated blank as well as in the sample.
- E - Identifies compounds whose concentrations exceed the calibration range of the GC/MS instrument for a specific analysis. This flag will not apply to PCBs analyzed by GC/EC methods.

- D - Identifies all compounds identified in an analysis at a secondary dilution factor. If a sample or extract is re-analyzed at a higher dilution factor, the "DL" suffix will be appended to the sample number and all reported concentration values will be flagged with the "D".

In addition to the preceding qualifiers, the following qualifiers will be used as applicable:

- Each surrogate recovery outside the QC limits will be flagged with an asterisk (*). If the surrogates are diluted out, the recoveries will be flagged with a "D." Surrogates diluted out will not be counted as outliers in the determination of completeness.

- Each percent recovery for matrix spikes which is outside the QC limits will be flagged with an asterisk (*). Also, if the RPD is outside the QC limits for MS/MSD, the data will be flagged with an asterisk (*).

Additional information, including examples of qualifiers, is provided in the reference methods.

9.3.2 Data Reporting System

Rizzo Associates will receive from the laboratory the sample results and a summary of the associated QC data. After the data have been validated (Section 9.2), the results will be reported in accordance with the guidelines previously discussed.

The results will be presented in the Phase I Site Investigation Report which will be submitted to the USEPA. Support data will be available at the laboratory and at Rizzo Associates' office for review. Records and documents will be maintained for 10 years from the effective date of the Order.

10.0 QUALITY CONTROL

A quality control (QC) program will be implemented so that consistent results of known and documented quality can be obtained. Both field and laboratory quality control measures will be followed to measure laboratory and total system variability. These measures are discussed in this section. Field QC involves the collection of split samples and field blanks. Laboratory QC includes internal procedures (blanks, spikes, surrogates, etc.) which are described in the reference methods for the parameters which will be analyzed. The analytical laboratory will implement stringent QC requirements that meet or exceed CLP requirements. Laboratory QC procedures which will be used for this project include:

- Initial calibration and calibration verification
- GC/MS instrument tuning requirements
- Surrogates
- Matrix spike analysis
- Duplicate analysis
- Matrix spike duplicate analysis
- Method blanks
- ICP interference check sample

The above-listed procedures are applicable to either organic or inorganic analyses or both. The first two items are described in Section 7.0, and the remainder are described in the following subsections. QC procedures for non-TCL parameters are described in the reference methods for the specific parameters.

10.1 FIELD DUPLICATE SAMPLES

A field duplicate sample is a sample prepared by dividing a sample into two aliquots. Duplicate samples will be handled as individual samples. The laboratory will not be made aware that a sample is a duplicate sample.

10.2 FIELD BLANKS

Field blanks are aliquots of analyte-free water brought to the field in sealed containers and transported back to the laboratory with the sample containers. Trip blanks and equipment blanks are two types of field blanks which will be used for this project.

Trip blanks will not be opened in the field. They are a check on sample contamination originating from sample transport, shipping and site conditions. Equipment blanks will be opened in the field and the contents will be poured over or through the sample collection device, collected in a sample container, and returned to the laboratory as a sample. Sufficient water will be taken to the field so that the equipment blank sample container is completely filled. For metal sample equipment blanks, the blank water will be filtered after passing through the sampling equipment. Equipment blanks are a check on sampling device cleanliness.

Trip blanks will accompany each batch of samples analyzed for volatiles. Equipment blanks will be collected at a frequency of one per matrix for each sampling event. A sampling event is a complete round of sampling for a matrix. An example of a sampling event would be the sampling of a group of monitoring wells. If an additional sampling is necessary, another equipment blank will be collected for each sampling event.

10.3 LABORATORY ORGANIC QUALITY CONTROL

The following paragraphs pertain to QC procedures related to the analysis of organic compounds.

10.3.1 Surrogates

Surrogates are organic compounds which are similar to analytes of interest in chemical composition, extraction, and chromatography, but which are not normally found in environmental samples. These compounds

will be spiked into all blanks, standards, samples, and spiked samples prior to analysis. Percent recoveries will be calculated for each surrogate. The surrogate compounds are listed in the reference methods.

The percent recoveries of the surrogates document laboratory performance on individual samples. Section 9.2.1 provides guidelines for reviewing and validation of data based on surrogates.

10.3.2 Method Blanks

A method blank is a volume of deionized, distilled laboratory water carried through the entire analytical scheme. For volatile analyses, a method blank will be performed once for each 12-hour time period. For semivolatiles, PCBs/pesticides, and inorganics, method blanks will be performed at the frequency described in the reference method for the parameter being analyzed. Section 9.2.2 describes criteria for the evaluation of method blanks.

10.3.3 Matrix Spike/Matrix Spike Duplicate Analysis

In matrix spike/matrix spike duplicate (MS/MSD) analysis, predetermined quantities of stock solutions of certain analytes will be added to a digestion and analysis. Samples will be split into duplicates, spiked, and analyzed. Percent recoveries will be calculated for each of the analytes detected. The relative percent difference between duplicate samples will be calculated and used to assess analytical precision. Section 9.2.3 describes the evaluation of MS/MSD results. When the concentration of the analyte in the sample is greater than 0.1 percent, no spike of the analyte will be necessary.

Project-specific MS/MSD analysis will be performed at the frequency of 5 percent. Additional sample volume (3X) will be collected for MS/MSD analysis.

10.3.4 Trip Blanks

Trip blanks consist of analyte-free water prepared by the laboratory which has been placed in VOA vials, sealed and transported with the empty sample containers to the site. At the site, the vials remain sealed and then accompany the sample containers back to the laboratory. The trip blank is analyzed for volatile organic compounds to deter-ine the existence of contamination problems that have been introduced during sample shipment and handling. A trip blank will be prepared and analyzed with each sampling shipment containing samples that will be subjected to volatile organic analysis.

10.4 LABORATORY INORGANIC QUALITY CONTROL

10.4.1 Method Blanks

Method blanks will be generated for other parameters with the same objectives as for volatile and semivolatile parameters (Section 10.3.2). Deionized, distilled water will be processed through the same preparation procedure at the frequency indicated in the reference method for the parameter being analyzed. Criteria used to ascertain whether sample concentrations reflect contamination are summarized in Section 9.2.4.

10.4.2 ICP Interference Check Sample

An ICP Interference Check Sample will be analyzed to verify interelement and background correction factors. This sample will be analyzed at the beginning and end of each sample analysis run or a minimum of twice per eight-hour time period, whichever is most frequent.

Criteria used to ascertain whether sample concentrations reflect interference are described in Section 9.2.5.

10.4.3 ICP Serial Dilution Analysis

The laboratory will perform ICP serial dilution analysis at the frequency described in the reference method for the parameter being analyzed. This will be done prior to reporting data. The evaluation of ICP serial dilution analysis results in relation to data validation is discussed in Section 9.2.6.

10.4.4 Spike Sample Analysis

A known amount of the analyte of interest will be added to a sample at the frequency described in the reference method for the parameter being analyzed. Percent recovery will be calculated for each analyte. The spiked sample analysis will provide information about the effect of the sample matrix on the digestion and measurement methodology. The spike will be added before the digestion and prior to any distillation steps. Evaluation criteria for percent recovery values are provided in Section 9.2.7.

10.4.5 Duplicate Sample Analysis

The laboratory will split a sample into two aliquots at the frequency described in the reference method for the parameter being analyzed. One aliquot will be the original sample and the other will be identified as the duplicate sample. Relative percent differences for each detected analyte will be calculated and then evaluated in accordance with the criteria summarized in Section 9.2.8.

11.0 AUDITS

11.1 FIELD OPERATIONS AUDIT

A field operations audit will be conducted during initial sampling/field activities to verify that field personnel are correctly following sampling procedures described in Sections 5.0 and 6.0. The field operations audit will involve an on-site visit by the Quality Assurance Officer or her designated representative and possibly by additional members of the project staff who are technically competent in the operations to be audited and who are not participating in the project. Items to be examined may, as appropriate, include the availability and implementation of approved work procedures; calibration and operation of equipment; labeling, packaging, storage, and shipping of samples obtained; performance documentation and checking; subcontractor performance; and variance documentation.

A field operations audit will be scheduled during the field activities. The Quality Assurance Officer will be notified by the Project Manager of the initiation of field work.

11.2 AUDIT PROCEDURES

Auditing will be initiated as early in the performance of an activity as practicable and will be conducted in accordance with the procedures described in the following paragraph.

Audits will be performed on the basis of a written checklist prepared prior to the audit. Checklists shall be developed to assure the review of necessary items and to document the results of the audit. The field operations audit will cover the applicable items listed in Section 11.1. During the audit and upon its completion, the auditor will discuss any findings with the individuals audited and will cite corrective actions to be initiated.

11.3 AUDIT REPORTS AND RESPONSES

Following completion of an audit, the auditor will prepare a report and submit it to the Project Director and Project Manager. This report will serve as notification to the appropriate management of audit results. The report will also be transmitted to pertinent individuals contacted during the audit. The report will be prepared as soon as possible (within 15 days) following the audit and will provide, as appropriate:

- Date and location of the audit;
- Identification of audit participants;
- Identification of activities audited;
- Audit results;
- Description of items requiring corrective action and, if possible, the means for correction; and
- Due date for completion of corrective actions, preventative actions, and/or audit response (maximum of 30 days from the issuance of the audit report).

The report will be signed by the auditor. Checklists may be provided with the audit report.

The individuals audited will be required to respond in writing to the audit report. The response shall clearly state the corrective action taken or planned. Completion of corrective action shall be verified by the auditor through written communication, re-audit, or other appropriate means.

11.4 AUDIT CLOSURE

After acceptance and verification of all corrective actions, the auditor will issue an audit closure to the same individuals receiving the audit report.

12.0 PREVENTIVE MAINTENANCE

The analytical laboratory will keep instrument log books which document maintenance schedules, dates, maintenance performed, and details of each maintenance action. Routine maintenance will be performed by laboratory personnel in accordance with manufacturer recommendations. Service agreements and preventive maintenance contracts are routinely secured by the laboratory for all critical instruments and equipment. These agreements provide for regular checks by qualified service personnel. Critical spare parts are maintained in accordance with manufacturer recommendations.

13.0 SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY, AND COMPLETENESS

Precision and accuracy for this project will be assessed through the analysis of duplicates, surrogates, matrix spike/matrix spike duplicate and spike samples. The appropriate QC procedure is specified in the analytical method. Section 10.0 summarizes the QC analyses. Completeness will be determined after validation of the data.

13.1 PRECISION

To determine the precision of the analytical methods, a program of replicate analyses will be followed. The laboratory will split a sample into two subsamples and analyze them independently at the frequency listed in the appropriate method.

The results of the replicate analysis will be used to calculate the quality control parameter (relative percent difference) for precision evaluation. The following equation is used to calculate relative percent difference (RPD):

$$RPD = \frac{|D_2 - D_1|}{(D_1 + D_2)/2} \times 100$$

where: D_1 - First subsample value
D_2 - Second subsample value

In addition to evaluation of the method precision, duplicate or split samples will be collected in the field and analyzed independently. The results will be used to evaluate the total systems variability, including sampling variations. These identity of field splits will not be known by the laboratory personnel.

The analytical precision produced by laboratory duplicate analyses will be evaluated by both the laboratory and Rizzo Associates, while field splits will be evaluated only by Rizzo Associates. Evaluation of both types of data will be in accordance with the reference methods and this plan.

13.2 ACCURACY

Accuracy is qualitatively discussed in Section 4.2. To determine the accuracy of an analytical method, a program of sample spiking will be followed. The spiking frequency will be as stated in the reference methods. The results of sample spiking will be used to calculate the quality control parameter (percent recovery) for accuracy evaluation. The following equation will be used:

$$\% \text{ Recovery} = \frac{SSR - SR}{SA} \times 100$$

where: SSR - Spiked sample result
SR - Sample result
SA - Spike added

Section 9.2.7 discusses the evaluation of spike sample analysis.

In addition to a spiking program, all samples, standards, and blanks subject to organic analyses will be spiked with surrogate compounds. Laboratory performance on individual samples will be established by the recovery of surrogate compounds. Additional discussion on surrogates is provided in Section 9.2.1.

13.3 COMPLETENESS

The objective of the Phase I sampling and analysis program is to determine site-specific characteristic parameters for possible additional investigations. The completeness goals to meet this objective are listed in Table 4-1. Completeness for each parameter is calculated as follows:

$$\frac{\text{Valid Data}}{\text{Total Data Generated}} \times 100 = \% \text{ Complete}$$

Valid data will be determined in accordance with the appropriate reference method and this plan (Section 9.0). The percent complete will be used to determine whether the data quality meets the objectives for the Phase I investigation.

If the completeness objectives are not met for individual parameters, the reasons for the invalid data will be reviewed by Rizzo Associates. Depending on the reasons (e.g., holding time exceeded) and the effect of the incomplete data on the accomplishment of the objectives, additional samples may be collected and analyzed. This subjective evaluation will also be performed if a sample does not generate data for a parameter category (e.g., pesticides, PCBs). Such a data gap could result from sample container breakage or loss or sample custody not being maintained. If it is determined by Rizzo Associates that the missing results are critical to accomplishing the project objectives, additional sampling will be performed to obtain the missing data.

14.0 NONCONFORMANCE/CORRECTIVE ACTION

14.1 NONCONFORMANCE

Nonconforming items and activities are those which do not meet the project requirements specified in the Order, Phase I Site Operations Plan, or the QA/QC Plan. Nonconformances may be detected and identified by:

- Project Staff
  During investigation and testing, supervision of subcontractors, and preparation and verification of analyses.
- Laboratory Staff
  During analysis, internal quality control, and data validation activities.
- Quality Assurance Officer
  As the result of audits (Section 11.0) and other quality assurance activities.

Each nonconformance shall be documented by the personnel identifying or originating it. Documentation will, as appropriate, include:

- Identification of the individual(s) identifying or originating the nonconformance.
- Description of the nonconformance.
- Method(s) for correcting the nonconformance (corrective action) or description of the variance granted.
- Schedule for completing corrective action.

The nonconformance documentation shall be submitted to the Project Manager, who will be responsible for notification of other staff, PPG, and regulatory agencies, as appropriate.

14.2 CORRECTIVE ACTION

Corrective actions pertaining to field activities will be defined when specific nonconformances are identified and documented.

Corrective actions pertaining to analytical procedures are directly related to the calibration, internal quality control, and data validation. Planned corrective actions and the predetermined limits for data acceptability, beyond which corrective action is required, are presented in Sections 7.0 through 10.0.

The authority to implement planned corrective action when nonconformances are detected or control limits are exceeded rests with the Project Manager for field and overall project operations and with the laboratory Quality Assurance Director for laboratory operations.

15.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

Reports detailing the results of audits and the performance of data measurement systems will be submitted to project management. These results will include:

- Periodic assessments of measurement data accuracy, precision, and completeness.
- Results of system audits.
- Results of performance audits.
- Significant QA problems and recommended solutions.

A description of these reports is provided in the following paragraphs.

15.1 MEASUREMENT DATA REPORTS

An assessment of measurement data precision, accuracy, and completeness will be summarized in a report. This report will be prepared by the analytical laboratory Quality Assurance Director and Project Quality Assurance Officer and will be submitted to the Project Manager and Quality Assurance Officer. At the completion of the project, the results of all previous reports will be summarized in a final report.

15.2 REPORTS OF SIGNIFICANT QA PROBLEMS AND RECOMMENDED SOLUTIONS

Significant quality assurance problems will be documented as findings in audit reports. Any such findings will require a written response from the Project Manager to the Quality Assurance Officer. In the event that these individuals cannot come to agreement, the Project Director will determine the resolution of the problem. All of the decisions and their bases will be documented.

TABLES

TABLES

TABLE 3-1

ADDRESSES AND PHONE NUMBERS OF PROJECT KEY INDIVIDUALS

KEY INDIVIDUAL	ADDRESS	PHONE NUMBER
Mark Terril	PPG Industries, Inc. C&R Environmental Engineering 260 Kappa Drive Pittsburgh, PA 15238	(412) 963-5830
Patrick F. O'Hara J. Timothy Onstott Beth F. Cockcroft Kenneth J. Bird	Paul C. Rizzo Associates, Inc. 300 Oxford Drive Monroeville, PA 15146	(412) 856-9700
Anneliese Hutchison M. Louise Hess	Lancaster Laboratories, Inc. 2425 New Holland Pike Lancaster, PA 17601	(717) 656-2301

TABLE 4-1

PRECISION, ACCURACY, AND COMPLETENESS OBJECTIVES

PARAMETER	MATRIX	PRECISION	ACCURACY	COMPLETENESS (%)
Volatile Organics	Soil/Water	(1)	(1)	80
Semivolatile Organics	Soil/Water	(1)	(1)	80
PCBs/Pesticides(2)	Soil/Water	(1)	(1)	80
Metals	Soil/Water	(1)	(1)	80
Cyanide	Soil/Water	(1)	(1)	80
pH	Water	±0.2 pH units	±10%	80
Specific Conductance	Water	<20 %	±10%	80
Temperature	Water	±0.5°C	±10%	80
2,3,7,8-TCDD	Soil/Water	(1)	(1)	80

1. Refer to the appropriate analytical reference method for precision and accuracy of individual parameters.
2. Includes PCNB, sevin, and malathion.

TABLE 5-1

CONTAINERS, PRESERVATIVES, AND HOLDING TIMES

SOIL OR SEDIMENT

ANALYSIS	BOTTLE TYPE[1]	PRESERVATIVE	HOLDING TIME
Volatiles	2 120-ml Glass Vial	Cool, 4°C	10 Days of Receipt
Semivolatiles	1 Pint Glass	Cool, 4°C	Extraction 10 Days of Receipt; Analysis 40 Days
PCBs/Pesticides	1 Pint Glass	Cool, 4°C	Extraction 10 Days of Receipt; Analysis 40 Days
2,3,7,8-TCDD	1 Pint Glass	Cool, 4°C	Extraction 30 Days of Receipt; Analysis 45 Days
Metals, Cyanide	1 Pint Glass	Cool, 4°C	6 Months (metals) 28 days (Hg) 14 days (Cn)

AQUEOUS

ANALYSIS	BOTTLE TYPE	PRESERVATIVE	HOLDING TIME
Volatiles	2 40-ml Glass Vial	Cool, 4°C	7 Days of Sampling (non-preserved)[3] 14 Days of Sampling (preserved with HCl)
Semivolatiles	2 1,000-ml Glass (amber)	Cool, 4°C	Extraction 5 Days of Receipt; Analysis 40 Days
PCBs	1 1,000-ml Glass (amber)	Cool, 4°C	Extraction 5 Days of Receipt; Analysis 40 Days
Pesticides	1 1,000-ml Glass (amber)	Cool, 4°C	Refer to appropriate analytical reference method for holding times of individual compounds

TABLE 5-1
(Continued)

ANALYSIS	BOTTLE TYPE	PRESERVATIVE	HOLDING TIME
2,7,3,8-TCDD	2 1,000-ml Glass (amber)	Cool, 4°C	Extraction 30 Days of Receipt, Analysis 45 Days
Metals	1 1,000-ml PE(2)	HNO_3 (pH<2)	6 Months (Hg - 28 Days)
Cyanide	1 1,000-ml PE	NaOH (pH>12)(4)	14 Days

1. Glass bottles are clear unless noted otherwise.
2. PE = Polyethylene.
3. Analysis will be within seven days from sampling.
4. If positive test for oxidizers is indicated by KI-startch paper, 0.6 gm of ascorbic acid will be added and retest will be performed to insure negative result. Sample will also be checked for presence of sulfides and, if present, ascorbic acid will be added with NaOH to preserve sample.

TABLE 8-1

PHASE I SAMPLE SUMMARY

SAMPLE MEDIA	NUMBER OF SAMPLES	FIELD DUPLICATE(1)	PARAMETERS(2)
Soil	42	2	B
Soil and Sediment	9(3)	1	A
Groundwater	6	1	C

1. Each field duplicate will require two additional samples for analysis.
2. Parameters
   - Group A: TCL, sevin, malathion, PCNB, 2,3,7,8-TCDD
   - Group B: TCL pesticides, sevin, malathion, PCNB
   - Group C: TCL, sevin, malathion, PCNB
3. Eight soil samples plus one sediment sample.

TABLE 8-2

ANALYTICAL METHODS

CATEGORY	MATRIX	EXPECTED CONC.(1)	SAMPLE PREPARATION(2)	ANALYSIS(2)
Volatile Organics	Water	Low	Purge & Trap	GC/MS
	Soil	Low	Purge & Trap	GC/MS
Semivolatile Organics	Water	Low	Sep. Funnel Extrtn.	GC/MS
	Soil	Low	Ultrasonic Extrtn.	GC/MS
PCBs/ Pesticides	Water	Low - Medium	Sep. Funnel Extrtn.	GC/EC
	Soil	Medium - High	Ultrasonic Extrtn.	GC/EC
2,3,7,8-TCDD	Water	Low	Sep. Funnel Extrtn.	GC/MS
	Soil	Low	Ultrasonic Extrtn.	GC/MS
Metals				
Mercury	Water	Low	Digestion	Cold Vapor AA
	Soil	Low	Digestion	Cold Vapor AA
Arsenic, Lead & Selenium	Water	Low	Acid Digestion	Furnace AA
	Soil	Low	Acid Digestion	Furnace AA
Other TCL Metals	Water	Low	Acid Digestion	ICP
	Soil	Low	Acid Digestion	ICP
Cyanide	Water	Low	Distillation	Option B
	Soil	Low	Distillation	Option B
Sevin	Water	Low	SOP-734(4)	SOP-734
	Soil	Medium	SOP-734	SOP-734
Malathion	Water	Low	3510/3520	8140
	Soil	Medium	3540/3550	8140
PCNB(3)	Water	Low	Sep. Funnel Extrtn.	GC/MS
	Soil	Medium	Ultrasonic Extrtn.	GC/MS

1. The determination of expected concentrations is based on sensitivity of analytical methods and does not apply to the magnitude of the expected environmental concentrations.
2. Refer to CLP methods for detailed procedures.
3. PCNB will be determined with TCL semivolatiles. For samples which do not have semivolatile analysis, PCNB will be determined by USEPA Methods 3540/3550 and 8270 (SW-846).
4. California Department of Health Services, Hazardous Material Laboratory, November, 1988 (modified).

APPENDIX A

300210

APPENDIX A

DRILLING, SAMPLING, AND MONITORING WELL INSTALLATION PROCEDURES

300211

APPENDIX A

DRILLING, SAMPLING, AND MONITORING WELL INSTALLATION PROCEDURES

A.1 TEST BORINGS

Test borings will be advanced using hollow-stem augers. A center plug or stinger will be utilized while advancing the boring. Standard penetration tests will be conducted in each test boring in accordance with ASTM D-1586.

A split-barrel sampler will be driven with a guided hammer into the unconsolidated soil. The inside of the split barrel will be flush with the inside of the drive shoe.

The bottom of the sampler shall be sharpened to form a cutting edge at its inside circumference. The beveled edge of the drive shoe will be maintained in good condition and, if excessively worn, will be replaced or reshaped to the satisfaction of the field engineer/geologist. The drive shoe of the sampler will be replaced if damaged in such a manner as to cause projections within the interior surface of the shoe. Each drill rig will be equipped with a minimum of two drive shoes which are in good condition. The sampler will be fastened to its drive pipe by a connection embodying a check valve arranged so as to permit the escape of fluid entrapped above the soil sample as the spoon is driven down into the soil, but which will close as the soil sample and sampler are withdrawn, thus preventing the development of hydraulic pressure on top of the soil sample.

The hammer or ram used to drive the sampler shall weigh 140 pounds and shall fall freely through a height of 30 inches. The number of blows required to drive the sampler each six inches for a total depth of 24 inches will be observed and recorded. The record will clearly show the

number of blows for each six inches of penetration. Cumulative blows will not be accepted. In soil requiring 50 blows or more per six inches of penetration, the sampler will be driven 12 inches and the number of blows for each successive six inches of penetration will be observed and recorded. In hard materials requiring more than 100 blows per six inches of penetration, the blows for smaller amounts of penetration may be observed and recorded with special note of the amount of penetration actually obtained.

Immediately upon removal from the borehole, the split-barrel sampler will be carefully disassembled and the soil will be classified. The most representative and least disturbed portion of the sample, measuring about three inches in length, will be trimmed and placed immediately into a glass jar. When a change in strata is observed in the materials found within the split-barrel sampler, a sample of each material shall be taken, and the depth of the change will be recorded.

A.2 CLASSIFICATION OF SOIL SAMPLES

Soils will be classified in accordance with the following classification categories. In general, soil will be considered either as granular or cohesive.

- Texture
  A granular soil will be considered basically either a gravel or a sand. Soils in either category shall be described as coarse, medium, or fine. The supplementary texture of the granular material will be described through the use of one adjective only. A cohesive soil will be considered basically either a silt or a clay. The supplementary texture of the cohesive material will be described through use of one adjective only.

- State
  Granular soils will be defined in terms of density, as very loose, loose, medium dense, dense or very dense (on the basis of SPT blowcounts). Cohesive soils will be defined in terms of consistency, as very soft, soft, medium

stiff, stiff, very stiff, or hard (on the basis of pocket penetrometer unconfined compressive strength).

- Moisture
  The amount of moisture present in a soil sample will be defined in terms of wet, moist, or dry.

- Color
  The basic color of a soil will be provided and the description will be amplified if necessary using adjectives such as light, dark, mottled, or mixed.

- Evidence of Contamination
  Any visual evidence of contamination will be noted. In addition, any odor that may indicate possible contamination will also be noted.

All information will be recorded on a boring log. Borings will be terminated at a depth of 20 feet, unless visible contamination is present below that depth. Typical boring log forms are provided in Appendix B.

A.3 GROUTING PROCEDURES

Upon completion of drilling, soil borings will be grouted from the bottom to the surface using the tremie method. A tremie pipe will be lowered to the bottom of the boring and a grout mix will be pumped through the pipe to the bottom of the boring. The grout mix will be in the following proportions:

- 1 94-pound bag Portland Type IA cement;
- 7 gallons water; and
- 5 pounds powdered bentonite.

A.4 MONITORING WELL INSTALLATION PROCEDURES

Six shallow monitoring wells will be installed as part of the Phase I Investigation. A deep monitoring well will be installed in a downgradient location as part of Phase II of the project. The deep monitoring well will be installed in the first groundwater-bearing zone

beneath the clay layer located 20 to 30 feet below the surface. A pilot test boring will be drilled at each of the shallow monitoring well locations as described in Section A.1. The hollow-stem augers utilized will have an inside diameter of at least eight inches and an outside diameter of not less than 11 inches. Each of these borings will be terminated approximately ten feet below the groundwater surface in the uppermost water bearing unit encountered at the site.

The deep monitoring well will be drilled using bentonite mud rotary drilling techniques. Potable water will be used in making the bentonite mud. The boring will be advanced in two stages. First, the entire uppermost water bearing unit will be drilled, and split-barrel samples will be obtained on 2.5-foot centers. Upon encountering the clay stratum, the hole will be reamed to 16 inches in diameter and 12-inch diameter Schedule 40 PVC casing will be lowered to the bottom of the boring and tremie grouted in place using a cement-bentonite grout. The grout mixture will be as defined in Section A.3.

After installation of the 12-inch diameter casing, the drill rig and associated equipment will be moved to the decontamination pad and thoroughly steam cleaned.

Twenty-four hours after the 12-inch casing has been installed, fluid within the casing will be flushed out and the underlying clay will be drilled to the top of the next saturated unit. The second stage of drilling will be performed using a tri-cone roller bit with bentonite mud as the circulating fluid.

Upon encountering the saturated unit, an eight-inch diameter Schedule 40 PVC casing will be lowered to the bottom of the boring and will be tremie grouted in place using cement-bentonite grout. The grout mixture will be as defined in Section A.3. The drill rig and associated equipment will again be steam cleaned.

Twenty-four hours after the eight-inch casing has been installed, fluid within the casing will be flushed out and the saturated unit will be drilled at an approximate diameter of eight inches to the desired depth.

A.5 WELL DESIGN AND CONSTRUCTION MATERIALS

All monitoring wells will be constructed in accordance with New Jersey regulations. Each will be constructed of four-inch inside diameter, Schedule 40 PVC flush joint threaded casing and screen. Only casing with water-tight joints will be used. Factory manufactured screen slots are required and shall be No. 10 size (.010 inch). Minimum screen length will be 10 feet. Joints will be wrapped with teflon tape and no PVC cementing agents will be used. All well construction materials (as well as drill rig and tools) will be thoroughly steam cleaned before use and between wells.

Once a boring has been drilled and all pertinent data obtained, the field engineer/geologist will determine the monitoring well design based on site-specific factors and the following general criteria:

1. All fluids shall be flushed from the temporary casing prior to well construction.

2. The annular space between the borehole wall and the well casing shall be backfilled with clean, bagged sand to a point at least two feet above the top of the screen. The sand filter should not be in contact with a water-bearing zone other than the one targeted for monitoring. The hollow-stem augers shall be withdrawn approximately one foot at a time while the sand is poured from the surface. The sand level should be frequently sounded and kept at the base of the augers or temporary casing until the desired length of sand filter pack is in place.

3. Approximately three feet of pelletized bentonite shall be placed above the sand-pack and allowed to hydrate. The bentonite seal shall then be tamped into a cohesive clay mass.

4. The remainder of the annular space shall be grouted with a cement-bentonite grout from the top of the bentonite seal upward to ground surface with a side-discharge tremie pipe.

5. A concrete pad shall be constructed at the surface to secure a protective steel casing with locking cap over the monitoring well.

Typical construction details for shallow and deep monitoring wells are shown on Figures A-1 and A-2, respectively.

A.6 WELL DEVELOPMENT

Each well will be developed using a surge block and pump or bailer. Prior to surging, the wells will be pumped to remove debris, sediment, and grout from the inside of the casing. Wells will be developed for a minimum of two hours or until they produce low-turbidity, chemically stable water. Field measurements of pH and conductivity will be used to establish chemical stability and to verify that grout contamination is not present. Monitoring wells yielding high pH water indicative of grout contamination of the sand filter pack will be unacceptable.

A Ground Water Monitoring Well Certification, Forms A and B will be completed for each well and submitted to the State by the Contractor. In addition, the NJDEP Well Permit Number will be affixed to each well by the Contractor.

A.7 FIELD CLEANING

The well casing and well screens will be field cleaned. They will be scrubbed to remove foreign material and then steam cleaned inside and out until all traces of oil and grease are removed. Adequate cleaning of well casing an screens shall be determined by the field engineer/geologist.

All equipment used in drilling and well installation must be properly cleaned to remove all foreign material. This includes drilling tools

and trailers used to haul equipment. Once cleaned, equipment must be stored in a manner to prevent contamination. All drilling equipment will be cleaned after work at one boring/well has been completed and prior utilization of the equipment at another boring/well.

A.8 GENERAL CONDITIONS

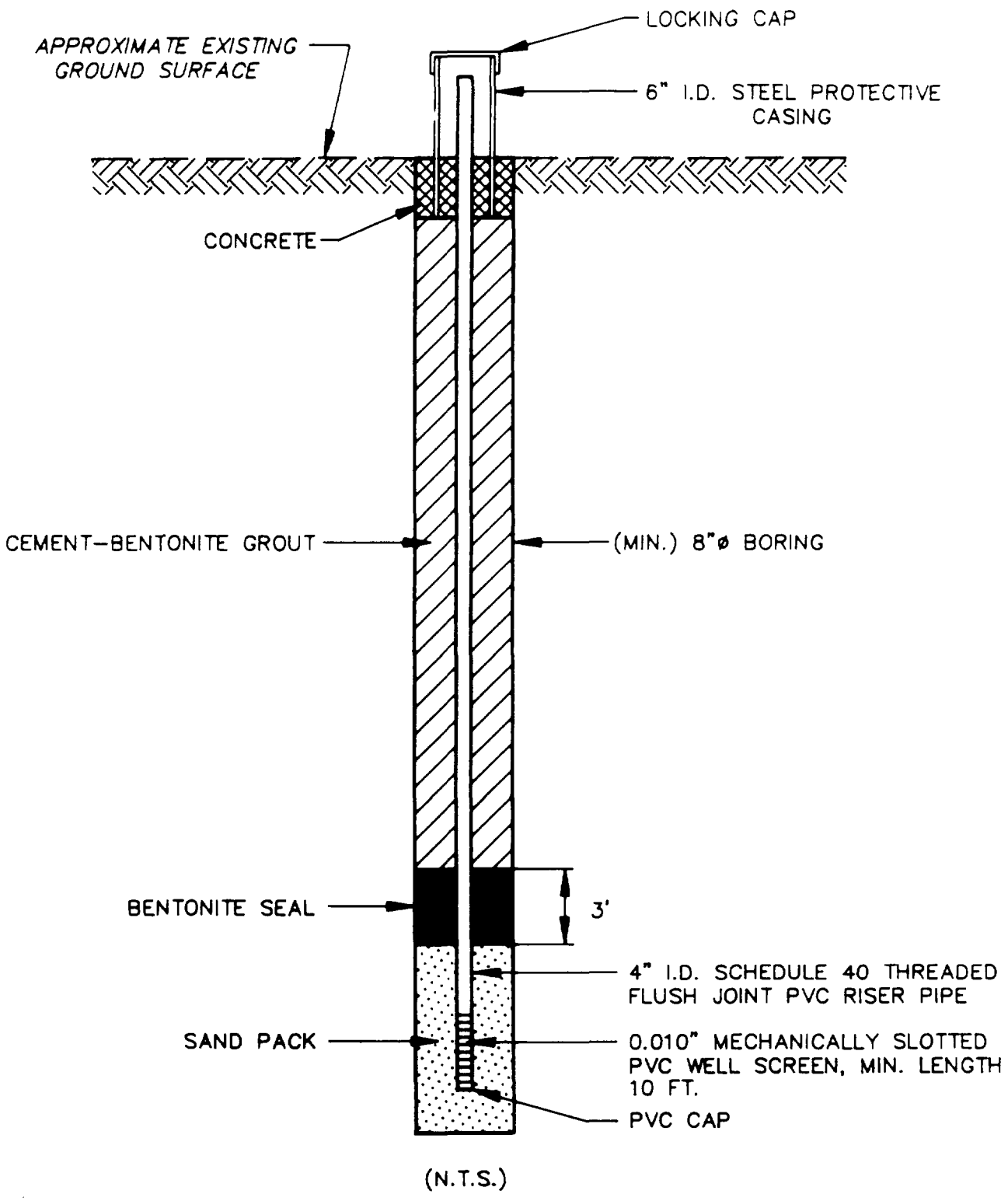
All such drilling, sampling, and other activities shall be conducted in accordance with the project Health and Safety Plan.

The Contractor shall supply all well construction materials, well development equipment, health and safety monitoring equipment, and all decontamination materials.

The Contractor shall be licensed to conduct the activities described above in the State of New Jersey and shall be responsible for obtaining and filing all appropriate permits for such work.

FIGURES

DRAWN BY	D.J.D. 6-13-89	CHECKED BY JTO 6-16-89	DRAWING NUMBER 89-595-A3 Δ
		APPROVED BY JTO 6-16-89	



(N.T.S.)

FIGURE A-1

SHALLOW MONITORING WELL
PULVERIZING SERVICE SITE
MOORESTOWN, NEW JERSEY

PREPARED FOR

PPG INDUSTRIES, INC.
PITTSBURGH, PENNSYLVANIA

300220

Δ GENERAL REVISIONS JTO 9-29-89
REVISIONS

Paul C. Rizzo Associates, Inc.
CONSULTANTS

Δ

DRAWING NUMBER	89-595-A4 ⚠
	6-16-89
	6-16-89
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APPROVED BY	JTO
	T. Jordan
	6-13-89
DRAWN BY	

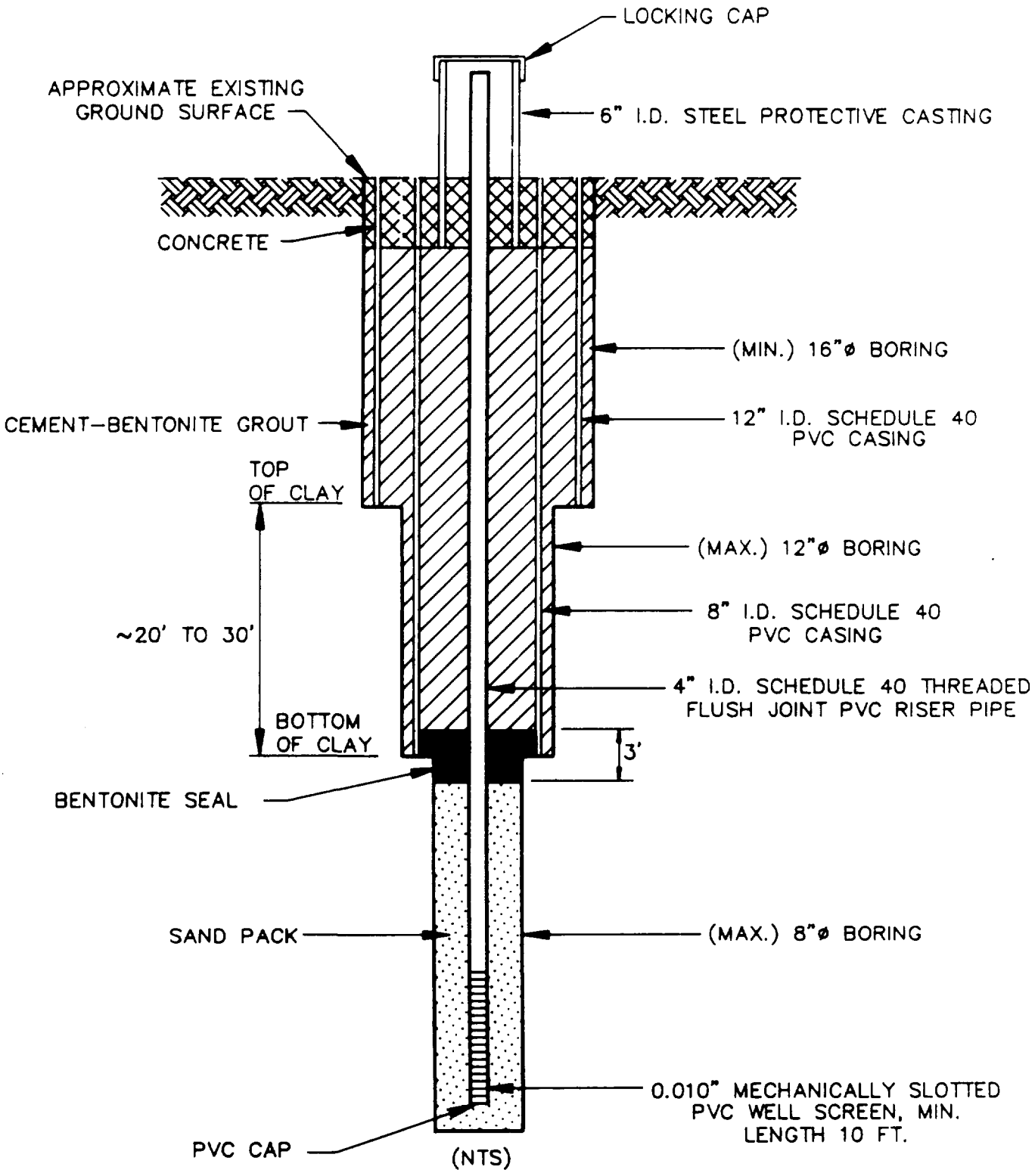

FIGURE A-2

DEEP MONITORING WELL
PULVERIZING SERVICES SITE
MOORESTOWN, NEW JERSEY

PREPARED FOR

PPG INDUSTRIES, INC.
PITTSBURGH, PENNSYLVANIA

300221

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REVISIONS	

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CONSULTANTS

⚠

APPENDIX B

FORMS AND RECORDS

TABLE OF CONTENTS

CONSULTANTS

VISUAL CLASSIFICATION OF SOILS

PROJECT NO. _____ PROJECT NAME _____

BORING NUMBER _____ APPROX. EL. _____ PAGE ____ OF ____

COORD. (N) _____ GWL: DEPTH ____ DATE/TIME ____ DATE _____

(E) _____ ____ DATE/TIME ____ DATE STARTED _____

DRILLING METHODS _____ ENG/GEO _____ DATE COMPLETED _____

DEPTH ( )	SAMPLE NO. AND TYPE	BLOWS ON SAMPLER PER ( )	RECOVERY ( )	DESCRIPTION	U.S.C.S. SYMBOL	MEASURED CONSISTENCY (TSF)	REMARKS

NOTES:

300225

VISUAL CLASSIFICATION OF ROCK

PROJECT NO. _____ PROJECT NAME _____

BORING NUMBER _____ APPROX. EL. _____ PAGE ____ OF ____

COORD. (N) _____ ENG/GEO _____ DATE _____

(E) _____ DRILLING METHODS _____ CORE SIZE _____

CASING INFORMATION		GROUNDWATER LEVEL DATA			
SIZE	DEPTH	ACTUAL TIME	DEPTH	ACTUAL TIME	DEPTH

RUN NUMBER	DEPTH ( )	RECOVERY	% RECOVERED	RQD	PROFILE	DESCRIPTION	JOINT SPACING	REMARKS

300226

TEST PIT CLASSIFICATION

PROJECT NAME _____ PROJECT NO. _____ PAGE ___ OF ___
FIELD ENG/GEO _____ APPROX. EL. _____ TEST PIT NO. ___
COORD. (N) _____ DEPTH TO GWL. _____ DATE _____
(E) _____

DEPTH ( )	SAMPLE NO. AND TYPE	SOIL PROFILE	DESCRIPTION	U.S.C.S. SYMBOL	REMARKS

NOTES:

300227

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SOIL SAMPLE
FIELD COLLECTION REPORT

PROJECT NAME _____ PROJECT NUMBER _____

DATE COLLECTED _____ TIME COLLECTED _____

COLLECTED BY _____

SAMPLE(S) LOCATION SKETCH (USE BACK SIDE IF NECESSARY)

SAMPLE ID NUMBER	DEPTH OF SAMPLE	SOIL DESCRIPTION (COLOR, COMPOSITION, STAINING, ODOR, FIELD MEASUREMENTS [1])

SAMPLING METHOD _____

COMPOSITE SAMPLE ? Y ☐ N ☐ COMPOSITE SAMPLE ID NUMBER _____

DESCRIBE COMPOSITING _____

SAMPLE TYPES COLLECTED

TYPE [2]	VOLUME	PER SAMPLE ?	PER COMPOSITE ?
		Y ☐ N ☐	Y ☐ N ☐
		Y ☐ N ☐	Y ☐ N ☐
		Y ☐ N ☐	Y ☐ N ☐
		Y ☐ N ☐	Y ☐ N ☐

NUMBER OF CONTAINERS _____

DATE RECEIVED BY LAB _____ LABORATORY _____

WEATHER CONDITIONS: _____

REMARKS _____

(1) ORGANIC VAPOR ANALYSIS, POCKET PENETROMETER, ETC.
(2) METALS, VOA, ORGANICS, ETC.

300228

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CONSULTANTS

WATER SAMPLE
FIELD COLLECTION REPORT

PROJECT NAME _____ PROJECT NUMBER _____

DATE COLLECTED _____ TIME COLLECTED _____

COLLECTED BY _____

SAMPLE ID NUMBER _____ SAMPLE LOCATION _____

STATIC WATER LEVEL _____ (FT.), MEASURED FROM(1) _____

CASING STICK UP _____ (FT.)

WELL VOLUMES PURGED _____, PURGING METHOD(2) _____

TYPE OF SAMPLE(3) _____, SAMPLING METHOD(4) _____

DEPTH OF SAMPLE _____ (FT.), MEASURED FROM(1) _____

SAMPLE COLLECTION ORDER _____

FIELD MEASUREMENTS

WATER TEMPERATURE _____ pH _____

SPECIFIC CONDUCTANCE _____ µmho/cm AT _____ TEMPERATURE

OTHER _____

METER CALIBRATION					
pH STD	METER READING	SP. COND. STD	METER READING	____ STD	METER READING

SAMPLE TYPES COLLECTED

TYPE(5)	VOLUME	FILTERED	PRESERVATION(6)
		Y ☐ N ☐	Y _____ N ☐
		Y ☐ N ☐	Y _____ N ☐
		Y ☐ N ☐	Y _____ N ☐
		Y ☐ N ☐	Y _____ N ☐
		Y ☐ N ☐	Y _____ N ☐
		Y ☐ N ☐	Y _____ N ☐

NUMBER OF CONTAINERS _____

DATE RECEIVED BY LAB _____ LABORATORY _____

WEATHER CONDITIONS: _____

REMARKS _____

(1) T.O.C.=TOP OF PROTECTIVE CASING; T.O.W.=TOP OF WELL CASING; G.S.=GROUND SURFACE
(2) BAILED, PUMPED, AIR LIFT, ETC.
(3) STREAM, POND, SPRING, WELL, SEEP, SUPPLY, ETC.
(4) BAILER, KEMMERER, GRAB, PUMP, ETC.
(5) GENERAL CHEM., METAL, VOA, ORGANICS, ETC.
(6) HNO_3, NaOH, H_2SO_4, $Na_2O_3S_2$, ETC.

300229

300230

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WELL DEVELOPMENT FORM

WELL NO. _____

PROJECT NAME:	PROJECT NO.

INITIAL WATER LEVEL: _____ DATE: _____

WATER LEVEL AFTER DEVELOPMENT: _____ TIME DEVELOPMENT STARTED: _____

TIME DEVELOPMENT CEASED: _____

WELL DEVELOPMENT TECHNIQUE(S) USED: _____

WAS WATER INJECTED INTO WELL DURING DEVELOPMENT YES ____ NO ____

IF YES GIVE APPROXIMATE VOLUME _____

APPROXIMATE VOLUME OF WATER REMOVED DURING DEVELOPMENT _____

VISUAL DESCRIPTION OF WATER: PRIOR TO DEVELOPMENT _____

AFTER DEVELOPMENT _____

WAS RECOVERY TEST RUN FOLLOWING DEVELOPMENT YES ____ NO ____

IF SO GIVE RESULTS: _____

ADDITIONAL REMARKS: _____

FIELD ENGINEER: _____ DATE: _____

PAGE _____ OF _____

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CONSULTANTS

CHAIN OF CUSTODY RECORD

PROJECT NO.:	PROJECT NAME:	NO. OF CON-TAINERS							COMMENTS
SAMPLER(S) (SIGNATURE):									
SAMPLE IDENTIFICATION	DATE	TIME	SAMPLE TYPE	SAMPLING LOCATION	VOLUME COLLECTED				

RELINQUISHED BY (SIGNATURE):	DATE/TIME:	RECEIVED BY (SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE/TIME:	RECEIVED BY (SIGNATURE):
RELINQUISHED BY (SIGNATURE):	DATE/TIME:	RECEIVED BY (SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE/TIME:	RECEIVED BY (SIGNATURE):
RELINQUISHED BY (SIGNATURE):	DATE/TIME:	RECEIVED BY (SIGNATURE):	REMARKS:		

Distribution-Original accompanies shipment, copy to project files.

SAMPLE TYPE:
W-WATER, S-SOLID, A-AIR, O-OTHER

LABORATORY:

NOTE: ALL SAMPLES ARE TO BE INSPECTED FOR PHYSICAL INTEGRITY UPON RECEIPT BY THE ANALYTICAL LABORATORY.

300231

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DATE			
NO.			
SHEET		OF	

FIELD ACTIVITY DAILY LOG

PROJECT NAME	PROJECT NO.

FIELD ACTIVITY SUBJECT:

DESCRIPTION ON DAILY ACTIVITIES AND EVENTS:

VISITORS ON SITE:	CHANGES FROM PLANS AND SPECIFICATIONS, AND OTHER SPECIAL ORDERS AND IMPORTANT DECISIONS.
WEATHER CONDITIONS:	IMPORTANT TELEPHONE CALLS:

PERSONNEL ON SITE.

(FIELD ENGINEER) DATE

300232

APPENDIX C

3001233

APPENDIX C

TARGET COMPOUND LIST

300234

APPENDIX C
TARGET COMPOUND LIST

METALS

Aluminum
Antimony
Arsenic
Barium
Beryllium
Cadmium
Calcium
Chromium
Cobalt
Copper
Iron
Lead
Magnesium
Manganese
Mercury
Nickel
Potassium
Selenium
Silver
Sodium
Thallium
Vanadium
Zinc

VOLATILES

Chloromethane
Bromomethane
Vinyl Chloride
Methylene Chloride
Acetone
Carbon Disulfide
1,1-Dichloroethene
1,1-Dichloroethane
1,2-Dichloroethene (total)
Chloroform
1,2-Dichloroethane
2-Butanone
1,1,1-Trichloroethane
Carbon Tetrachloride
Vinyl Acetate
1,2-Dichloropropane
Trichloroethene
Dibromochloromethane
1,1,2-Trichloroethane
Benzene
Trans-1,3-Dichloropropene
Bromoform
4-Methyl-2-Pentanone
2-Hexanone
Tetrachloroethene
Toluene
1,1,2,2-Tetrachloroethane
Chlorobenzene
Ethyl Benzene
Styrene
Xylenes (total)
Bromodichloromethane
Cis-1,3-Dichloropropene

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APPENDIX C
(Continued)

SEMIVOLATILES - Base/Neutral Fraction

Phenol	Dimethylphthalate
Bis(2-Chloroethyl)ether	Acenaphthylene
1,3-Dichlorobenzene	2,6-Dinitrotoluene
1,4-Dichlorobenzene	3-Nitroaniline
Benzyl Alcohol	Acenaphthene
1,2-Dichlorobenzene	Dibenzofuran
Bis(2-Chloroisopropyl)ether	2,4-Dinitrotoluene
N-Nitroso-di-n-dipropylamine	Diethylphthalate
Hexachloroethane	4-Chlorophenyl-phenyl ether
Nitrobenzene	Fluorene
Isophorone	4-Nitroaniline
Benzoic Acid	N-Nitrosodiphenylamine
Bis(2-Chloroethoxy)methane	4-Bromophenyl-phenylether
1,2,4-Trichlorobenzene	Hexachlorobenzene
Naphthalene	Phenanthrene
4-Chloroaniline	Anthracene
Hexachlorobutadiene	Di-n-butylphthalate
Benzo(g,h,i)perylene	Fluoranthene
2-Methylnaphthalene	Pyrene
Hexachlorocyclopentadiene	Butylbenzyphthalate
2-Chloronaphthalene	3,3'-Dichlorobenzidine
2-Nitroaniline	Benzo(a)anthracene
Benzo(k)fluoranthene	Chrysene
Benzo(a)pyrene	Bis(2-Ethylhexyl)phthalate
Indeno(1,2,3-cd)pyrene	Di-n-octylphthalate
Dibenz(a,h)anthracene	Benzo(b)fluoranthene

APPENDIX C
(Continued)

SEMIVOLATILES - Acid Fraction

2-Chlorophenol
2-Methylphenol
4-Methylphenol
2-Nitrophenol
2,4-Dimethylphenol
2,4-Dichlorophenol
2,4,6-Trichlorophenol
2,4,5-Trichlorophenol
2,4-Dinitrophenol
4-Nitrophenol
4,6-Dinitro-2-Methylphenol
Pentachlorophenol
4-Chloro-3-Methylphenol

PESTICIDES/PCBS

Alpha-BHC
Beta-BHC
Delta-BHC
Gamma-BHC (Lindane)
Heptachlor
Aldrin
Heptachlor Epoxide
Endosulfan I
Dieldrin
4,4'-DDE
Endrin
Endosulfan II
4,4'-DDD
4,4'-DDT
Methoxychlor
Endrin Ketone
Alha Chlordane
Gamma-Chlordane
Toxaphene
Aroclor-1016
Aroclor-1221
Aroclor-1232
Aroclor-1242
Aroclor-1248
Aroclor-1254
Aroclor-1260
Endosulfan Sulfate

CYANIDE

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APPENDIX D

DOCUMENT DISTRIBUTION LIST

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The following people will receive a copy of the QA/QC Plan and any subsequent revisions.

NAME	POSITION	COMPANY
Mr. Mark Terril	Facility Coordinator	PPG Industries
Mr. Patrick F. O'Hara	Project Director	Rizzo Associates
Dr. J. Timothy Onstott	Project Manager	Rizzo Associates
Ms. Beth F. Cockcroft	Quality Assurance Officer	Rizzo Associates
Ms. Anneliese Hutchison	Laboratory Project Manager	Lancaster Labs.
Ms. M. Louise Hess	Laboratory QA Director	Lancaster Labs.
Mr. Nigel Robinson	Project Manager	USEPA
Mr. Eugene Dominach	On-Scene Coordinator	USEPA